Later he conceived the idea of employing the same engine for a re-determination of the mechanical equivalent of heat. To absorb and measure the power generated, he used an ingenious form of hydraulic brake, which he had designed some years before. The value given as the result of these experiments is universally accepted.

In looking through Osborne Reynolds's collected works one is struck by the thoroughness and acumen with which he pushed his ideas to their full consequences on the theoretical and physical, as well as the practical and engineering side.

Thus while he was investigating the condensation of steam with a view to its practical explanation, Crookes's beautiful experiments on the radiometer attracted his notice, and he tried to bring the two phenomena into connection. This led him to a first attempt at explaining the radiometer action, which was subsequently abandoned in favour of the now generally accepted view. This investigation caused him to consider the relative efficiency of convection, conduction, and radiation in the transmission of heat, and he obtained results which were applied to engineering problems.

If we turn to his hydrodynamical work, we find that a practical problem—the racing of propeller screws—first led him to this subject, but he was soon drawn to questions of high theoretical interest, such as the transmission of energy in waves with their application to group velocities.

It is difficult at the present time fully to estimate the place which his great work on the "Sub-mechanics of the Universe" will ultimately occupy. His point of view differs in important respects from that which is at present in favour, but he proved right on so many occasions when he struck out a line of his own, that it would not be surprising if at any rate some portion of his work were—perhaps with a different interpretation of symbols—to find its application in the further development of our ideas on the constitution of the fundamental medium.

To those who only knew Osborne Reynolds in his later life, when a difficulty of putting his thoughts into words grew upon him, and finally developed into a fatal illness, the beautiful clearness and precision of his earlier writings may come as a surprise. Together with Roscoe, Balfour Stewart, Gamgee, Stanley Jevons, Ward, and Williamson, he formed one of the band of workers which first made Owens College famous as a centre of teaching and investigation.

He was elected a fellow of the Royal Society in 1877, and received a Royal medal of that Society in 1888, but this and an honorary degree conferred by the University of Glasgow was the only public recognition he ever received.

NOTES.

THE following fifteen candidates have been selected by the council of the Royal Society to be recommended for election into the society:—Prof. J. O. Arnold, Prof. C. G. Barkla, Mr. L. Cockayne, Mr. A. L. Dixon, Sir T. L. Heath, Dr. H. O. Jones, Prof. T. R. Lyle, Dr. W. McDougall, Mr. R. Messel, Prof. B. Moore, Mr. E. Nettleship, Mr. R. Newstead, Vice-Admiral Sir H. J. Oram, Dr. G. T. Prior, and Mr. R. C. Punnett.

THE King will open the London Museum, Kensington Palace, on March 21. The Queen will accompany his Majesty at the opening ceremony.

THE Berlin correspondent of *The Times* announces the death, at seventy-seven years of age, of Prof. Richard Andrée, of Leipzig, known as a geographer and author of several ethnographic books.

THE General Board of the National Physical Laboratory will hold its annual meeting at the laboratory on Friday, March 15, when the various departments of the laboratory will be open for inspection, and apparatus of particular interest will be on view.

IN the Italian Chamber on February 24 a motion was made and carried to express the sympathy of the Italian nation with the British in the loss of Lord Lister, who was described as one of the most illustrious benefactors of humanity.

AT a representative and influential private meeting on February 27, convened by the Lord Provost of Glasgow, it was unanimously agreed that a memorial of an important character to the late Lord Lister should be erected in Glasgow, the birthplace of aseptic surgery. A committee was appointed to consider various suggestions as to the form which the memorial should take, and to report upon them.

THE annual autumn meeting of the Institute of Metals will be held in London on two days in the last week of September. The next meeting of the institute will be the occasion of the third May lecture, which will be delivered on May 10 by Sir J. A. Ewing, K.C.B., F.R.S., on the subject of "The Inner Structure of Simple Metals."

A SMITHSONIAN expedition, under the direction of Mr. H. C. Raven, will start in a few days for Borneo, where a collection of vertebrates and ethnological material will be made for the United States National Museum. The field work will be carried on in eastern Dutch Borneo, the natural history of which is almost unknown.

REFERRING to a note on the October issue of *Tropical Life*, published in these columns on November 30, 1911 (vol. lxxxviii., p. 154), Dr. H. D. Gibbs informs us that he has written to our contemporary to correct some of the data wrongly attributed to him in the article mentioned. Dr. Gibbs points out that the writer in *Tropical Life* should have said that "750 to 1000 hectares of nipa swamp will operate a 500-ton sugar-mill 180 days each year, not a 100-ton mill continuously."

WE notice with regret the death, on February 21, in his ninety-second year, of Sir John G. N. Alleyne, Bt., known as an authority in engineering and for his interest in iron and steel research, especially the application of the spectroscope to analysis. Sir John Alleyne was, we learn from *The Times*, an original member of the Iron and Steel Institute, and was a vice-president of the institute during recent years. He was also a member of the Institution of Civil Engineers and the Institution of Mechanical Engineers. He was associated with many important railway contracts, including the building of the St. Pancras Station of the Midland Railway, and was responsible for the design of much colliery plant.

SPEAKING in the House of Commons on Monday, February 26, the Minister for Agriculture said it is proposed to place at the disposal of Rothamsted a sum of about 2000*l*. annually to help the extension of new work on special lines of research. Arrangements are being made to send several scientific experts to India to prosecute inquiries relating to foot-and-mouth disease, in connection with the commission recently appointed upon the subject. It is anticipated that the cost of this commission will run into some thousands of pounds.

MR. RUNCIMAN, President of the Board of Agriculture and Fisheries, has appointed a committee to advise the Board on matters relating to the development of forestry. References will be made to the committee from time to time as occasion arises. The committee will be asked, in the first instance:—(1) to consider and advise upon proposals for a forestry survey; (2) to draw up plans for experiments in sylviculture, and to report upon questions relating to the selection and laying out of forestal demonstration areas; (3) to advise as to the provision required for the instruction of woodmen. The committee is constituted as follows:—Sir Stafford Howard, K.C.B. (chairman), Mr. F. D. Williams-Drummond, Sir S. Eardley-Wilmot, K.C.I.E., Mr. R. C. Munro Ferguson, M.P., Lieut.-Colonel D. Prain, C.M.G., C.I.E., F.R.S., Mr. E. R. Pratt (president of the Royal English Arboricultural Society), Sir W. Schlich, K.C.I.E., F.R.S., Prof. Wm. Somerville, and the Hon. Arthur L. Stanley. Mr. R. L. Robinson, of the Board of Agriculture and Fisheries, will act as secretary.

A MEMORANDUM of the Secretary of State for War relating to the Army Estimates for 1912–13, just issued as a Parliamentary Paper, states that after careful consideration by the Committee of Imperial Defence, it has been decided to establish at once a joint Army and Navy School of Aviation at which officers of both services shall be taught to fly, before proceeding to the separate Army and Navy establishments at which they will be exercised in the more specialised requirements of their respective services. A site for the school has been selected on Salisbury Plain, and the purchase of the necessary land will be completed at the beginning of April. Building, to plans which have been already prepared, will be pressed forward rapidly, and it is hoped at a very early date to have accommodation at the school for officers and men, instructors, and mechanics, as well as the necessary sheds for aëroplanes and workshops for their repair and adjustment. Provision has also been made on an extended scale for purchase of aëroplanes and other necessary equipment for the school. The Estimates further provide for continuing the experimental and other work of the Army Aircraft Factory, for further buildings required for airships, for an addition of personnel to Army establishments for aëroplane work, and for a considerable number of aëroplanes as a first instalment of the equipment of the Field Army. The total sum provided for the above services amounts to 322,000*l.*, which includes an Admiralty contribution of 14,000*l.* to the general expenses of the school. The increased provision for aviation services is 177,000*l.*

IN a lecture delivered at University College, on February 20, in connection with the Francis Galton Laboratory for National Eugenics, Dr. M. Greenwood pointed out that public opinion respecting the possibility of influencing the infant death-rate by administrative action had greatly changed during the last 100 years, the prevalent belief being that the great majority of deaths in the first year of life were due to preventable causes. Apart from the supposed ill-effects of the industrial employment of mothers, three factors had been associated in the public mind with the rate of infant mortality, viz. the birth-rate, the prevalence of artificial feeding, and poverty. The general conclusion which the lecturer emphasised was that the effects of administrative reforms upon the infant death-rate were in danger of being exaggerated. Any such exaggeration was calculated to do a great deal of harm, because expectations were raised which could not be realised, and the consequent reaction in the public mind might lead to general indifference towards the subject of sanitary administration.

THE general exhibition of lunar study which the Astronomical Society of Barcelona proposes to hold in the University of that city, under the honorary presidency of the Rector of the University, Baron de Bonet, will be open to the public from May 15 to June 15. This exhibition has for its object the grouping in one harmonious whole of the discoveries relating to our satellite. It will comprise at least the following sections:—A, lunar cartography; B, representations of the moon by drawings and models; C, photographs of the moon; D, lunar physics; E, the study of the tides; F, observatories and instruments; G, apparatus for cosmographic demonstration; H, history and biography; I, lunar astrology. The committee arranging the exhibition will be glad to receive offers of assistance from any interested persons, whether members of the society or not. Already exhibits are being received, and the society is anxious to get into touch with anyone who possesses books, drawings, photographs, sketches, models, &c., of items of lunar interest. The last day for entries is April 15, and the last day for receiving exhibits is May 1. The society offers diplomas to exhibitors and to all who contribute in any way to the success of the exhibition. All correspondence and offers of help, &c., regarding the exhibition should be addressed to Don Salvador Raurich, secretary of the society, Gran Via Diagonal, 462, Barcelona, Spain.

DR. A. H. YOUNG, Emeritus professor of anatomy in the University of Manchester, a former president of the Anatomical Society of Great Britain and Ireland, died at his residence in Didsbury on February 22, of an illness which had incapacitated him for the past three years. Prof. Young exercised a considerable influence upon British anatomy during the last quarter of a century, not only by his own investigations, but even more so by the researches which he inspired his assistants to carry on. Much of his earlier work, such as the memoirs on the anatomy of the elk, the hyæna, and the northern beluga, was done in collaboration with his predecessor, Prof. Morrison Watson; but at the same time he carried out a series of investigations of his own upon the anatomy of Phascolarctos, Viverra, Proteles, and the elephant, devoting especial attention to the musculature of the marsupial hand and forearm. After he succeeded to the chair of anatomy in Manchester he and his assistants became interested in embryology, and they produced a series of morphological memoirs, in which the facts of ontogeny and comparative anatomy were happily blended. Prof. Young himself concentrated his attention mainly upon the problems of the morphology of arteries, his best known work being his strong attack upon the commonly accepted interpretation of the middle sacral or caudal artery as the prolongation of the dorsal aorta.

IN a Reuter telegram from Khartûm which appeared in the Press last week, it was stated that Prof. Garstang had discovered at Meroë evidence that the Roman Empire extended much further south than has hitherto been supposed, even to Meroë (Kabushîa) itself, the evidence for this conclusion being the discovery of a Roman temple, &c. In this way, the telegram adds, the presence at Meroë of the Augustus-head discovered last year is explained. We have not as yet the facts of the discovery which have led Prof. Garstang to this conclusion, but until they have been carefully examined it would be rash to accept so revolutionary a statement as certain. Hitherto, though the Roman legions are known to have marched so far south as Gebel Barkal (Napata) in the reign of Augustus in order to punish a Nubian invasion of Egypt, the southernmost Roman permanent post has always been supposed to have been Primis[1](Ibrîm), and this was only occupied for a short time, the usual "furthest south" having been Syene (Aswân), or at most Hierasykaminos (Mahárraka), at the southern end of the Dodekaschoinos. No literary authority under the Empire gives the slightest hint of any such thing as a Roman station far south of Napata, and within 150 miles of Khartûm, and until definite evidence comes from Prof. Garstang we must suppose that his Roman temple is no more than a Nubian copy of one, and means no regular Roman station. Had there been such a station at Meroë, Strabo could not have failed to mention it.

THE "Memorandum to Sanitary Authorities on the Subject of Epidemic Poliomyelitis" (infantile paralysis, see NATURE, vol. lxxxvii., p. 494), which was issued by the Local Government Board in December, 1911, has now been followed by the publication of further reports upon the subject (New Series, No. 61). The volume contains a report by Dr. Reece on the prevalence of the disease in Devonshire and Cornwall in 1911; another, by Dr. Farrar, on outbreaks in the Midlands and Dorsetshire in 1910; notes by Dr. Mervyn Gordon on the bacteriology of the disease; and clinical and epidemiological notes by Dr. Hugh Macewan. The number of known cases in the Devon and Cornwall outbreak up to September 16, 1911, was 154, with thirty-four deaths, but probably many mild and abortive cases escaped notice. The report concludes with a grave indictment of some of the public authorities of the districts concerned on account of their reluctance to take the steps necessary to cope with the disease.

WE are glad to welcome a new series of publications by the Museum of the University of Pennsylvania. The series will comprise the publications of the Babylonian section of the museum; and a beginning has already been made by the issue of a monograph on "Babylonian Hymns and Prayers," by the Swedish scholar Dr. David W. Myhrman. It is well known that the University of Pennsylvania possesses a very rich collection of tablets obtained as the result of four expeditions which conducted excavations on the site of the Babylonian city of Nippur between the years 1888 and 1900. The greater number of the texts published in the present volume are from this site; others are from collections purchased in London and Baghdad. The tablets contain religious compositions, the majority of which are written in Sumerian, the language of the early non-Semitic inhabitants of Babylonia. Since they date from the end of the third millennium B.C., they are of very great interest as throwing light upon the development of Babylonian religious ideas in their earlier stages. Dr. Myhrman has expended an immense amount of labour in order to reproduce the original script as closely as possible, working on the principles which have governed earlier publications of the Pennsylvania Museum. But, at any rate in the more crowded texts, we could wish that a more conventional transcript had been adopted; this would undoubtedly save time in publication, and would be a real help to the reader. The excellent photographic plates already furnish the student with the necessary epigraphical data. But, apart from this suggestion, we have only praise for the volume before us, which makes the texts available for students on the plan already employed by the great museums of London, Paris, and Berlin. We note with pleasure that the new series largely owes its success on the material side to the generosity of Mr. Eckley Brinton Coxe, jun., who has already done so much to further the scientific aims and interests of the University of Pennsylvania.

AN account of the vertical migrations of *Mysis mixta* in the Baltic is given by A. Otterström in *Meddelelser fra Kommissionen for Havundersögelser*, Plankton, Bd. i., No. 9. The observations deal only with the summer months June, July, and August. During the daytime the Mysis are found only on the bottom. Between 8 and 10 p.m. they move upwards into the higher water layers, the height to which they rise apparently varying with the intensity of the light. The author considers that the whole phenomenon is controlled by light-intensity, and that temperature has little, if anything, to do with it. As *M. mixta* is an important food of the herring in the Baltic, the question is one of some practical interest.

Two papers recently published by Danish investigators (Danish hydrographical investigations at the Faroe Islands in the spring of 1910, by Martin Knudsen, in *Meddelelser fra Kommissionen for Havundersögelser*, Hydrografi ii., No. 1, and The plankton on a submarine bank, by Ove Paulsen, in *Biologiske Arbeider Tilegnede Eug. Warming*, November, 1911), throw new light upon an oceanographical problem of very considerable interest, namely, the physical and biological conditions upon an isolated bank surrounded by deep water in mid-ocean. The Faroe Bank, which the two authors deal with, lies in the Atlantic at a considerable distance to the S.W. of the Faroe Islands. The temperature of the water on the bank is lower than that of the surrounding ocean water at similar depths, and at the same time the salinity is less. The water on the bank agrees in these features with water from lower depths in the surrounding ocean, and Dr. Knudsen is probably correct in his view that the bank is covered by water which has run up along the slope of the bank from the deep water surrounding it. The plankton on the bank itself is shown to be markedly different, at all seasons at which samples were taken, from that found in the immediate neighbourhood off the bank, the bank plankton having a distinctly neritic, or shallow water, character.

WE learn from *The Journal of Agriculture of South Australia* that an anonymous donor has presented a sum of money to the University of Adelaide for the purpose of providing scholarships for post-graduate work. These are to be called the Lowrie scholarships, in recognition of the services rendered by Mr. William Lowrie, the director of agriculture for the colony. It is proposed that the scholarships be tenable for one year.

WE have received a copy of *La Vie Agricole*, a new weekly agricultural paper issued by J. B. Baillière et Fils, Paris, proposing to deal with scientific and practical matters of agricultural interest. Prof. Perrier gives an interesting summary of the problem of sex determination, whilst M. Diffloth writes an informing article on the desiccation of potatoes in Germany. Summaries are also given of investigations carried out in other countries. Altogether, the new journal promises to form a very useful addition to agricultural literature.

IT appears from *The Journal of Agriculture of South Australia* that the policy of repurchasing estates for closer settlement in South Australia continues to justify itself by the results. Large estates are bought by the Government and subdivided into small holdings of about 300 acres. In one case, where formerly not more than 400 persons inhabited a large area, the population rose under the new system to more than 4500. The value of the improvements effected is invariably high. A very great change in the agriculture of the country is certain to set in, with results that must be wholly beneficial.

AFTER exhaustive experiments with practically all improved artificial pasture grasses, extending over a period of some eight years, the Department of Agriculture in Natal has, we learn from *The Agricultural Journal of the*

Union of South Africa, been compelled to the opinion that *Paspalum dilatatum* and *Phalaris commutata* are the only types which promise to hold their own for more than two years in the veldt conditions obtaining in the midlands of Natal against the competition of native grasses and the weeds of cultivated ground. Paspalum flourishes on very poor soil, and proved excellent for stock. Phalaris is more resistant to frost, but less tolerant of drought and soil poverty. Favourable reports on these grasses are also received from the Transvaal.

RECENT numbers of the Circular and Agricultural Journal of the Royal Botanic Gardens, Ceylon, deal largely with experiments on the tapping of Hevea rubber, by Messrs. Lock, Bamber, and Holmes. A remarkable pest is also described by Mr. Green. The rubber slug, *Mariaella Dussumieri*, Gray, frequents recently tapped Hevea trees and imbibes the latex oozing from the cuts, thus causing an appreciable diminution of the scrap rubber that could be collected after tapping. It seemed barely credible at the time that any animal could digest liquid rubber, but direct experiment showed that when some of the living slugs were provided with a saucer of rubber-milk they at once began to lap it up. The slugs, further, do serious injury to young plants. The only remedial measures at present suggested are traps and the destruction of all rubbish.

A PAPER has been published in the Journal of the Asiatic Society of Bengal, by Mr. B. Hooper, on phosphorus in Indian foodstuffs. The author begins by accepting the well-known conclusions of certain medical investigators that the lack of phosphorus in cleaned or milled rice is the predisposing cause of beri-beri. By experimenting on fowls with rice of varying quality, it was demonstrated that polyneuritis (similar to the human disease) was developed when milled, but not husked, rice was used. Rice containing only 0·277 per cent. of phosphoric anhydride brought on the disease in a few weeks, while rice containing 0·469 per cent. formed a healthy diet. A number of analyses have therefore been made of rice samples from various parts of India. On an average, unmilled rice contained 0·65 per cent. of phosphoric anhydride, and milled rice 0·38 per cent. The pulses contained more, and it is significant that the pulse-eaters generally remained free from the disease, whilst their neighbours, the rice-eaters, were attacked.

NOT long ago the Secretary of State for the Colonies announced that it had been decided in principle to maintain the central establishment of the Imperial Department of Agriculture for the West Indies for a further period of ten years. The opportunity has therefore been taken in No. 4 of the West Indian Bulletin to review broadly the work of the Department in the past, and to indicate some of the problems for the future. There are undoubted signs that the West Indies are recovering from the distress in which they have been plunged during the latter part of the nineteenth century. Confidence in the sugar industry has revived as the result of the abolition of bounties and improved trade relations with Canada; the production of cacao in Trinidad, Grenada, and Jamaica has increased; a considerable American fruit trade has grown up in Jamaica; Sea Island cotton has been introduced into St. Vincent, Barbadoes, and the Leeward Islands; limes have been much grown in Dominica, and rice in British Guiana. But if the conditions are favourable for crops they are equally favourable for pests, and perhaps nowhere is more careful and continuous work necessary on the part of mycologists and entomologists. There is also much scope for the work of the plant-breeder, for it has been shown that some of the new seedling canes are very much more profitable than the older ones.

THE current issue of the Journal of the Quekett Microscopical Club (November, 1911) contains interesting observations, by Mr. D. J. Scourfield, on the use of the centrifuge in pond-life work. He finds that a high speed (7000–10,000 revolutions per minute) is necessary to bring about the concentration of some of the more minute organisms; when so high a speed is required, centrifuge tubes holding only about 1·5 c.c. are used. This method is to be regarded as accessory to the ordinary methods of collection by means of nets and filters. Mr. C. D. Soar gives a list of fifty species of Hydrachnids (water-mites) collected, for the most part near London, by the late Mr. Saville-Kent, whose account of the anatomy of these animals is also published. Mr. E. M. Nelson contributes some hints on methods of illumination in microscopic work, and lays great stress on the importance of centring the beam of light entering the objective, in order to obtain good definition. Whether the beam is centred properly is most readily ascertained by examining, either with the unaided eye or with a hand-lens, the "Ramsden disc," the centre of which should be illuminated. Mr. Nelson adds some notes on the use of colour-screens. Dr. E. Penard gives an account of fourteen species (three of which are new) of fresh-water Rhizopods from Sierra Leone, and Mr. T. A. O'Donoghue records the finding of dimorphic spermatozoa in the human flea and in the blow-fly.

WHILE the geology of Newfoundland has been investigated to some extent, its physiography has hardly been touched upon from the modern point of view. In the January number of *The American Journal of Science* Mr. W. H. Twenhofel contributes a very instructive description of the island from his observations made during a study of the geological structure of the western and north-western coasts. The topography is strongly impressed by the structure, of which the north-easterly trend finds expression in parallel ridges and valleys having the same direction as the folds and faults, softer strata and zones of weakness having been eroded. The upland surface presents the dissected remains of a former peneplain, which once extended over the whole of Newfoundland, and which it is suggested may have been completed before Cretaceous time, like that of the Appalachian region. Elevated valleys occur at altitudes of 800 to 1200 feet, and may probably be attributed to erosion at a period when the land stood lower by about this amount than at present. This cycle of erosion was not completed, but was interrupted by renewed uplift of the Long Range in pre-glacial times, since the evidence tends to show that this range owes its origin to the faulting upward of a block from the foreland's level.

THE Survey Department of Egypt has commenced the publication of Bulletins dealing with the astronomical and geophysical work carried out at the Khedivial Observatory at Helwan. No. 1, by Mr. E. B. H. Wade, deals with the local attraction of the plumb-line in the prime vertical near the Nile Valley, which has been observed during the work on the geodetic survey of Egypt which is in progress. It had been anticipated that so much as 2″ might be met with, but when the triangulation had been carried about 150 kilometres south of Cairo the values obtained for a pair of azimuths taken to and fro across the valley were found to be discordant to the extent of 11·9″. After the careful elimination of instrumental errors, a direct determination of the difference of longitude between the observatory on the east and a base terminal point on the west of the valley by a method especially suitable to the case, and the reobservation of the azimuth of the southern side, the conclusion is reached that in this part of the Nile Valley the local attraction in the prime vertical is 8·8″ and 6·9″ by different methods on the northern side, and 12·6″ on the more southern side, the plumb-bob being repelled from the axis of the Nile Valley. The method employed is described.

We have received the fourth and concluding part of the first volume of the Bulletin of the Seismological Society of America. The papers which it contains are mostly brief. Among the more interesting may be mentioned a biographical notice with an excellent portrait of Major C. E. Dutton, described, in forgetfulness of Prof. C. G. Rockwood, as America's first seismologist. Mr. Otto Klotz gives a simple method of locating the epicentre of an earthquake from the duration of the first series of tremors at three widely separated stations. Mr. E. C. Templeton describes a rather strong earthquake on July 1, 1911, in Central California. From the nature of the shock and the disposition of the isoseismal lines it is evident that the earthquake was a twin, the more important of the two foci being situated near Coyote, a village twelve miles south-east of San Juan. The paper of greatest value is one by Prof. A. C. Lawson on a remarkable series of small post-Glacial fault scarps near Banning, in western Ontario. They have been exposed by the removal of the glacial drift, which until recently has helped to preserve the sharpness of the scarps. The glaciated rock so far uncovered is about a quarter of an acre in area, and is dislocated by a large number of small reversed, or overthrust, faults. Along a transverse line 66 feet in length twenty-four scarps were counted, the height of which ranges from an eighth of an inch to 3¾ inches. The movement of the faults, as shown by the displacement of the glacial striæ, was invariably in the direction of the dip.

The Journal of the Franklin Institute for January contains a noteworthy paper, recently read by Prof. Cleveland Abbe, entitled "The Obstacles to the Progress of Meteorology." To form an adequate idea of the important questions dealt with it would be necessary carefully to peruse the paper. Prof. Abbe states at the outset that he is not a pessimist. He says:—"We have been so long accustomed to fairly accurate and very useful daily weather forecasts that we begin to look for perfection in long-range predictions. Let us be optimistic and believe that eventually these will come." But he asks why it is that that progress has been so slow, and why we have been unable definitely to establish the existence of periods in our local climates. Possibly they do not exist, but if they do they are completely covered up by the defects of observations. He gives a number of illustrations showing that observations have been at fault because instruments have been faulty, exposures changed by growth or disappearance of trees, and various other causes. Although balloon observations now record what is going on ten or fifteen miles above us, and although daily weather maps have been published for the whole of the northern hemisphere, the great obstacle that hinders perfect prediction is our ignorance of many details as to the laws that govern the atmosphere. The author considers that the existence of laboratories specially adapted to atmospheric experiments is of fundamental importance, and the association therewith of able students trained in mathematics and physics. "When all this is realised, the intellectual work that will there be done will gradually remove all obstacles to the eventual perfection of our knowledge of the atmosphere." But, as in the case of astronomical observatories and all other scientific institutes, plans must be made for many years of labour.

Since the introduction of the earth inductor as an instrument for the determination of the magnetic dip, the question is often asked, Does the earth inductor or the dip circle give the more accurate results? The editor of *Terrestrial Magnetism and Atmospheric Electricity* gives the results of his experience in a note in the December (1911) number. The earth inductor, once set up, gives a result in fifteen minutes five times as accurate as the dip circle will give in an hour. While dip circles differ amongst themselves by a few minutes, inductors agree to within a few tenths of a minute of arc. For survey work, when the instrument has to be set up afresh at each place of observation, the present type of inductor has no advantage over the dip circle, but it is hoped that ere long an inductor suitable for such work will be constructed.

The first number of the Science Reports of the Tôhoku Imperial University, Sendai, Japan, contains an important paper by Prof. Honda on the thermo-magnetic properties of forty-three chemical elements, most of which were obtained in a state of great purity. The magnetic susceptibilities of these elements up to temperatures in many cases exceeding 1000° C. were measured by the pull exerted on them by the non-uniform magnetic field between the pointed poles of a Du Bois electromagnet. The strength of the field could be increased to 23 kilogauss, and was determined by the aid of a small coil and a ballistic galvanometer. The pull was measured by means of a torsion balance. With the exception of iron, nickel, and cobalt, these elements have susceptibilities which are independent of the intensity of the magnetic field. Some of them change their susceptibility with change from solid to liquid or from one crystalline form to another. The susceptibility appears to be connected intimately with the position of the element in the periodic system of chemical classification. The laws stated by Curie, *i.e.* for diamagnetic substances, susceptibility generally independent of temperature, and for paramagnetic inversely proportional to the absolute temperature, were found not to be correct, and Prof. Honda substitutes the law: increase of temperature produces a change of susceptibility towards that of the element of next higher atomic weight.

Some interesting conclusions concerning the spectra produced in gases and vapours by different types of electric discharge are recorded by M. G. Millochau in a paper which is published in No. 18, vol. cliii., of the *Comptes rendus*. By projecting an image of the spark on to a slit, an image of which was in turn projected on to a photographic film revolving at a known rate, the author obtained photographic evidence as to the nature and duration of the discharge. At the same time he photographed the spectrum produced in various gases, enclosed in Plücker tubes, by the different discharges, and so was able to correlate the different spectra with the respective types of discharge producing them. By this means he differentiates seven types of "simple" discharges, each of which always produces the same spectrum, whatever may be the pressure in the tube, and finds that in a complex discharge the resulting spectrum is the summation of the spectra produced by the several superposed "simple" discharges; the simple discharges range from a continuous discharge obtained, for example, by joining up the terminals of the secondary of a Ruhmkorff coil, without condenser, directly to the terminals of the vacuum tube, to an intermittent discharge from a condenser through a considerable resistance. The "simple discharges" may be grouped under three general heads:—(1) the slow discharge, (2) the "semi-brusque" discharge, and (3) the "brusque" discharge, of which the respective durations are of the order of 0·01 sec., 0·0001 sec., and 0·00001 sec., and M. Millochau briefly describes the different types of spectra produced in various gases by each. Thus in CO_2 the first produces the "Swan" spectrum, while the second produces the spectrum of carbonic oxide in place of the "Swan." With the "brusque" discharge, "line" spectra are produced, the lines of hydrogen and helium being always broad. Finally, M. Millochau arrives at the most important conclusion that his results favour the dissociation hypothesis, inasmuch as they appear to show that the production of the various spectra depend upon the temperature of the vibrating molecule and upon the dissociation effects which correspond to this temperature.

OUR ASTRONOMICAL COLUMN.

ASTRONOMICAL OCCURRENCES FOR MARCH:—

March 2.	2h. 0m.	Mercury in superior conjunction with the Sun.
4.	5h. 0m.	Mars at quadrature to the Sun.
4.	16h. 0m.	Jupiter at quadrature to the Sun.
9.	22h. 36m.	Jupiter in conjunction with the Moon (Jupiter 4° 59′ N.).
13.	19h. 12m.	Uranus in conjunction with the Moon (Uranus 4° 43′ N.).
15.	19h. 6m.	Venus in conjunction with the Moon (Venus 3° 43′ N.).
19.	16h. 44m.	Mercury in conjunction with the Moon (Mercury 1° 47′ N.).
20.	11h. 30m.	Sun enters Sign of Aries; Spring Equinox.
22.	6h. 14m.	Saturn in conjunction with the Moon (Saturn 1° 36′ N.).
24.	20h. 30m.	Mars in conjunction with the Moon (Mars 2° 44′ S.).
26.	16h. 19m.	Neptune in conjunction with the Moon (Neptune 5° 53′ S.).
27.	14h. 0m.	Mercury at greatest elongation east of the Sun. (18° 51′ E.).
31.	17h. 0m.	Venus in aphelion.

THE ECLIPSE OF THE SUN ON APRIL 17.—In a memoir prepared by the Madrid Observatory there is an excellent account of the conditions for the total and annular eclipse which will be visible in the peninsula on April 17 next. Intended for popular information, the memoir contains not only the data calculated for the eclipse in general and for several favourable localities, but also gives an account of the geometry of eclipses, the methods of calculation, the results, and some excellent diagrams and maps showing the track of the shadow.

As an example of the application of the method of calculating the values for any particular place, Cacabelos (long. = 6° 42′ 57″ W. of Greenwich; lat. = 42° 35′ 53″ N.) is selected, and for this place it is found that totality will last 4·6 seconds, the middle of the eclipse occurring at 23h. 48m. 54·7s. Other places where the eclipse will be total were selected, and, in order to ensure accuracy, a commission was appointed to determine their geographical coordinates. They are Barco de Valdeorras and Verin, and their positions were found to be:—long. 3° 17′ 43·5″ W. of Madrid, lat. 42° 25′ 5·4″ N., and long. 3° 45′ 12·0″ W. of Madrid, lat. 41° 56′ 29·0″ N., respectively. The track of the eclipse across the peninsula is shown on a large-scale map (1 : 500,000) at the end of the memoir, the central line passing from immediately north of Ovar, in Portugal, to Oviedo, and leaving the northern coast slightly to the east of Gijon.

THE EARLY BABYLONIAN ECLIPSE OF THE SUN.—In a paper appearing in part iii., vol. ii., of the Transactions of the Royal Society of South Africa, Mr. Nevill discusses at length the vexed question of the date to be assigned to the eclipse of the sun recorded on Tablet No. 35968 of the British Museum collection, which Dr. Cowell has identified with the eclipse of −1062, July 31. He describes the broken tablet, and discusses Mr. King's reading of the same from several aspects, arriving at the conclusion that the internal evidence does not preclude a date in the twelfth century B.C., or even earlier. After examining every eclipse occurring between 1250 and 920 B.C., Mr. Nevill, by several processes of elimination, finds that, without assuming any secular acceleration of the sun's motion, the eclipses which fit the various conditions, of time, date, place, &c., best are those of June 5, 1217, May 18, 1123, and May 31, 956 B.C., and of these three the first most closely corresponds with theory and observation.

Finally, he points out that Dr. Cowell's hypothesis of secular acceleration, permitting a number of ancient eclipses to be recognised, constitutes a strong case if no other hypothesis can be found, but its adoption raises several questions which for the present cannot be satisfactorily answered.

THE PROPER MOTIONS OF THE STARS IN THE CLUSTERS *h* AND χ PERSEI.—Vol. v. of the *Recherches Astronomiques de l'Observatoire d'Utrecht* is devoted to a thesis prepared by M. A. van Maanen dealing with an investigation of the proper motions of 1418 stars in and near the famous double cluster *h* and χ Persei.

The object of the investigation was twofold: first, to find the proper motion of the two clusters; secondly, to determine the frequency of the proper motion according to its amount and to the magnitudes of the stars for this region of the sky. From a number of plates six were selected, two pairs taken by Kostinsky in 1896 and 1908, and one pair by Donner in 1892 and 1909, and among the conclusions arrived at it is maintained that this method of using pairs of plates is not inferior to that where the images are impressed upon the same plate at different epochs. The proper motions resulting from the discussion are so small as to render it impossible to make out which stars are, and which are not, members of the groups. In determining the frequency of the proper motions, it was found that, of the 763 stars considered, 300 had P.M.'s between 0·010″ and 0·019″, while only 142 had motions less than 0·010″; no sufficient reason has yet been found for the relatively small number of small proper motions.

THE TERRESTRIAL MAGNETIC EFFECTS OF SOLAR RADIATION.—In an extract from *Ciel et Terre* (No. 12, 1911) Dr. A. Brester discusses the causes which produce the diurnal oscillation of the magnetic needle and other terrestrial magnetism effects. In the place of the vortices produced by the heating effects of the solar radiation, he would substitute vortices produced by solar kathode rays, and he shows how the action of these would be concentrated in the neighbourhood of the earth's poles where the greatest oscillations of the needle are recorded. Further, he points out that electrical tourbillons would not be disturbed by ordinary atmospheric disturbances, and thus would give regular changes such as are observed, and also that, the electrical state of the sun depending on the solar activity, his theory would account for the observed relation between the diurnal oscillations of the needle and the number of sun-spots.

ABSORPTION OF LIGHT IN SPACE.—The January number of the Monthly Notices contains an interesting paper by Mr. F. G. Brown, in which the author discusses the absorption of light in interstellar space. Taking all the nebulæ given in the N.G.C., he found approximate measures of the intrinsic brightness of each by comparing the total brightness, or conspicuousness, as given in the N.G.C. with the diameter. Although this method of dealing with the subject cannot be regarded as final, the results are very striking, and indicate that the small nebulæ appear less bright per unit area than do the large nebulæ, or, in other words, the probably distant are fainter than the probably near. Mr. Brown's preliminary investigation also suggests that the absorption is different in different directions through space.

AN OBSERVER'S HANDBOOK.—"The Observer's Handbook for 1912," published by the Royal Astronomical Society of Canada, is a valuable compendium of the data likely to be required by the isolated amateur. It contains various ephemerides and tables, useful star-charts, notes on the constellations and phenomena for each month, tables showing the times of sunrise and sunset for each day in latitudes 44°–52°, and brief accounts of the eight comets of 1911. The handbook contains sixty-four pages, and is sold for 25 cents at the society's rooms, 198 College Street, Toronto.